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10/675,587	09/29/2003	Theodore Doros	42P16636	9936

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EXAMINER

TRINH, MICHAEL MANH

ART UNIT PAPER NUMBER

2822

DATE MAILED: 12/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/675,587

Applicant(s)

DOROS ET AL.

Examiner

Michael Trinh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 23-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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## DETAILED ACTION

\*\*\* This office action is in response to Applicant's Amendment filed on October 14, 2005.

Claims 1-25 are pending, in which claims 23-25 are non-elected without traverse.

\*\*\* The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### *Claim Rejections - 35 USC § 102*

1. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Schiltz et al (6,387,808).

Schiltz teaches a method comprising: forming a layer 16/20 material on a silicon wafer 10 (Fig 2a, col 2, lines 33-67; Fig 5a, col 5, line 5-67), the silicon wafer 10 having variations in surface topology comprising at least one thick region and at least one thin region, the layer 20/16 of material having variations in surface topology comprising at least one thick regions and at least one thin region corresponding to the thick regions and the thin regions of the wafer 10, respectively; forming at least one narrow region and at least one wide region in the layer 20/16 of material, the narrow regions (narrow region 21 in Fig 2b; and 202 in Fig 5b) and the wide regions (wider region 21 in Fig 2b; and wider region 204 in Fig 5b) corresponding to the thick regions and the thin regions of the wafer 10, respectively; and exposing photoresist photosensitive resin 20 disposed on the layer 16 of material to light through a mask 22 (Fig 2a; col 2, lines 41-47; line 64 through col 3; col 3, lines 41-50) having a pattern to which near-resolution marks have been added, wherein a plurality of openings 24 are formed between the added near-resolution masks; and removing portions of the layer 16/20 of material to leave the narrow regions and the wide regions (narrow region 21 in Fig 2b; and 202 in Fig 5b; and wider region 21 in Fig 2b; and wider region 204 in Fig 5b). Re claim 2, further comprising of removing portions of the layer 16/20 of material to leave the narrow regions and the wide regions (narrow region 21 in Fig 2b; and 202 in Fig 5b; and wider region 21 in Fig 2b; and wider region 204 in Fig 5b). Re claim 3, wherein the method comprises characterizing the thick regions of the wafer as first zones; characterizing the thin regions of the wafer as second zones; and forming the narrow regions in the first zones and the wide regions in the second zones (col 2, lines 20-25; col 5, lines 1-25; Figs 1; 2a-2c; 5a-5c). Re claim 4, wherein the method comprises setting first imaging compensation for the first zones and second imaging compensation for the second zones

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(col 1, lines 26-33; Figs 1; 2a-2c; 5a-5c; col 2, lines 20-25; col 5, lines 1-25); and removing areas of the layer 16/20 of material to leave the narrow regions in the first zones and the wide regions in the second zones (narrow region 21 in Fig 2b; and 202 in Fig 5b; and wider region 21 in Fig 2b; and wider region 204 in Fig 5b).

2. Claims 1,3 are rejected under 35 U.S.C. 102(b) as being anticipated by Chapman (5,976,769).

Chapman teaches a method comprising: forming a layer 208,206 material on a silicon wafer 202 (Fig 2a, col 2, lines 46-65), the silicon wafer 202 having variations in surface topology comprising at least one thick region 203 and at least one thin region 204, the layer 208,206 of material having variations in surface topology comprising at least one thick regions and at least one thin region corresponding to the thick regions and the thin regions of the wafer 202, respectively; forming at least one narrow region (e.g. 217 in Figs 2g,3) and at least one wide region (e.g. 218 in Fig 2g,3) in the layer of material (Figs 2c-2g,3), the narrow regions and the wide regions corresponding to the thick regions and the thin regions of the wafer, respectively (Figs 2g,3; col 2, line 66 through col 3); and exposing photoresist photosensitive resin 210 (Fig 2a) disposed on the layer 208,206 of material to light through a mask having a pattern to which near-resolution marks have been added so that a first photoresist pattern 212 having larger resolution and a smaller near-resolution photoresist pattern 211 having a width W are formed thereon (Figs 2c-3; col 2, line 66 through col 3). Re claim 3, wherein the method comprises characterizing the thick regions of the wafer as first zones (Fig 2a-2g,3); characterizing the thin regions of the wafer as second zones; and forming the narrow regions in the first zones and the wide regions in the second zones (Figs 2g,3).

***Claim Rejections - 35 USC § 103***

3. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schiltz et al (6,387,808) taken with Ledger (5,502,564).

Schiltz teaches a method as applied above to claims 1-4, wherein there is an unevenness of substrate topography, and wherein the method comprises forming at least one narrow region and at least one wide region in the layer 20/16 of material, the narrow regions (narrow region 21

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in Fig 2b; and 202 in Fig 5b) and the wide regions (wider region 21 in Fig 2b; and wider region 204 in Fig 5b) corresponding to the thick regions and the thin regions of the wafer 10, respectively

Re claim 5, Schiltz lacks mapping to determine the thick and thin regions. Re claim 6, wherein the mapping is ellipsometric, laser, or capacitance.

However, Ledger teaches determining and measuring variation of wafer thickness by mapping the substrate surface (col 1, lines 7-10; col 10, lines 18-32; col 7, lines 30-31; Figs 1-8), wherein the mapping techniques includes ellipsometric mapping (at Fig 1; col 7, lines 60-63; col 8, lines 1-4), laser mapping (col 8, lines 26-29); and capacitance mapping (col 1, lines 56-59).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the method of Schiltz to determine the thick and thin regions by mapping the substrate surface, wherein techniques for mapping includes ellipsometric, laser, or capacitance, as taught by Ledger. This is because of the desirability to precisely determine the locations of thick and thin regions on the wafer so that narrow and wide regions can be correspondingly and precisely formed respectively thereon.

4. Claims 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schiltz et al (6,387,808) taken with Kozhukh (6,437,903).

Schiltz teaches a method as applied above to claims 1-4, and fully incorporated herein.

Schiltz thus lacks mentioning a machine-accessible medium including data that, when accessed by a machine, cause the machine to perform the methods of claims 1-4 above.

However, Kozhukh teaches (at col 6, lines 58-61; col 4, lines 10-45) about employing a machine-accessible medium including data that, when accessed by a machine, cause the machine to perform the methods.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to store the methods of Schiltz in a machine-accessible medium, as taught by Kozhukh so that when accessed by a machine, cause the machine to perform the stored methods in an automatic manner.

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5. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schiltz et al (6,387,808) and Kozhukh (6,437,903), as applied to claims 7-10, and further of Ledger (5,502,564).

Schiltz and Kozhukh teaches a method as applied to claims 7-10 above, wherein Kozhukh teaches (at col 6, lines 58-61; col 4, lines 10-45) about employing a machine-accessible medium including data that, when accessed by a machine, cause the machine to perform the methods, and wherein Schiltz teaches an unevenness of substrate topography and a method comprises forming at least one narrow region and at least one wide region in the layer 20/16 of material, the narrow regions (narrow region 21 in Fig 2b; and 202 in Fig 5b) and the wide regions (wider region 21 in Fig 2b; and wider region 204 in Fig 5b) corresponding to the thick regions and the thin regions of the wafer 10, respectively

Re claim 11, the references including Schiltz lack mapping to determine the thick and thin regions.

However, Ledger teaches determining and measuring variation of wafer thickness by mapping the substrate surface (col 1, lines 7-10; col 10, lines 18-32; col 7, lines 30-31; Figs 1-8), wherein the mapping techniques includes ellipsometric mapping (at Fig 1; col 7, lines 60-63; col 8, lines 1-4), laser mapping (col 8, lines 26-29); and capacitance mapping (col 1, lines 56-59).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the method of Schiltz to determine the thick and thin regions by mapping the substrate surface, as taught by Ledger. This is because of the desirability to precisely determine the locations of thick and thin regions on the wafer so that narrow and wide regions can be correspondingly and precisely formed respectively thereon.

6. Claims 12,13,16,17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schiltz et al (6,387,808) taken with Van Der Plas (5,015,602) and Atkinson (5,155,053).

Schiltz teaches a method comprising: forming a layer 16/20 material on a silicon wafer 10(Fig 2a,col 2, lines 33-67; Fig 5a, col 5, line 5-67), the silicon wafer 10 having variations in surface topology comprising at least one thick region and at least one thin region, the layer 20/16 of material having variations in surface topology comprising at least one thick regions and at least one thin region corresponding to the thick regions and the thin regions of the wafer

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10, respectively; and forming at least one narrow region and at least one wide region in the layer 20/16 of material, the narrow regions (narrow region 21 in Fig 2b; and 202 in Fig 5b) and the wide regions (wider region 21 in Fig 2b; and wider region 204 in Fig 5b) corresponding to the thick regions and the thin regions of the wafer 10, respectively, wherein the method includes exposing photoresist photosensitive resin 20 disposed on the layer 16 of material to light through a mask 22 (Fig 2a; col 2, lines 41-47; line 64 through col 3; col 3, lines 41-50) having a pattern to which near-resolution marks have been added, wherein a plurality of openings 24 are formed between the added near-resolution masks; and removing portions of the layer 16/20 of material to leave the narrow regions and the wide regions (narrow region 21 in Fig 2b; and 202 in Fig 5b; and wider region 21 in Fig 2b; and wider region 204 in Fig 5b). Re claim 16, wherein the method comprises characterizing the thick regions of the wafer as first zones; characterizing the thin regions of the wafer as second zones; and forming the narrow regions in the first zones and the wide regions in the second zones (col 2, lines 20-25; col 5, lines 1-25; Figs 1; 2a-2c; 5a-5c). Re claim 17, wherein the method comprises setting first imaging compensation for the first zones and second imaging compensation for the second zones (col 1, lines 26-33; Figs 1; 2a-2c; 5a-5c; col 2, lines 20-25; col 5, lines 1-25); and removing areas of the layer 16/20 of material to leave the narrow regions in the first zones and the wide regions in the second zones (narrow region 21 in Fig 2b; and 202 in Fig 5b; and wider region 21 in Fig 2b; and wider region 204 in Fig 5b).

Re claim 12, Schiltz lacks forming a sacrificial layer on the first layer, and lacks using direct write of a pattern on photoresist. Re further claim 13, wherein direct writing uses electron beam, ultraviolet light, x-rays, or optical beam.

However, Van Der Plas teach (at Figs 9-11) forming a plurality of layers on the silicon wafer, wherein the plurality of layers includes a sacrificial layer 15 formed on a first layer 20/18, and wherein the sacrificial layer has a variations in surface topology comprising a thick and thin regions corresponding to the thick and thin regions of the first layer 18/20, respectively. Atkinson teaches (at Figs 19-22; col 9, lines 17-30) to form a pattern having small and near-resolution limit by direct writing on a photoresist 60, wherein, re further claim 13, the direct writing uses electron beam, ultraviolet light, x-rays, or optical beam (col 9, lines 17-25).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the device structure of Schiltz by forming a plurality of layers on the silicon wafers, wherein the plurality of layers includes a sacrificial layer formed on a first layer, as taught by Van Der Plas. This is because of the desirability to form an etch stop layer on the first layer so that the layer can be etched in an selective manner. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to form a pattern in the first layer of Schiltz by direct writing on a photoresist layer formed on the first layer, as taught by Atkinson, in which the direct writing uses electron beam, ultraviolet light, x-rays, or optical beam (col 9, lines 17-25). This is because of the desirability to form a small and near-resolution pattern on the silicon wafer, wherein processing steps and cost are reduced since it is directly written on the photoresist by directly irradiating electron beam, ultraviolet light, x-rays, or optical beam, without using a photomask.

7. Claims 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schiltz et al (6,387,808) taken with Van Der Plas (5,015,602) and Atkinson (5,155,053), as applied to claims 12,16,17 above, and further of Banks et al (5,112,440).

The references including Schiltz, Van Der Plas, and Atkinson teaches a method as applied to claims 12,16 and 17 above.

The combined references teach a photoresist, but lack mentioning a photosensitive polymer (claim 14) or a non-polymer photoresist (claim 15).

However, Banks teaches (at col 5, lines 19-21) patterning a layer by using a photoresist material, wherein the photoresist includes conventional photosensitive and non-photosensitive polymers.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the pattern of the references including Schiltz by employing a photoresist material including conventional photosensitive and non-photosensitive polymers, as taught by Banks. This is because photosensitive and non-photosensitive polymers are alternative and art recognized equivalent materials for forming a photoresist so that small and near-resolution pattern can be effectively formed.



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8. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schiltz et al (6,387,808) taken with Van Der Plas (5,015,602) and Atkinson (5,155,053), as applied to claims 12,13,16,17 above, and further of Ledger (5,502,564).

The references including Schiltz, Van Der Plas, and Atkinson teach a method as applied to claims 12,13, 16 and 17 above, wherein Schiltz teaches an unevenness of substrate topography and a method comprises forming at least one narrow region and at least one wide region in the layer 20/16 of material, the narrow regions (narrow region 21 in Fig 2b; and 202 in Fig 5b) and the wide regions (wider region 21 in Fig 2b; and wider region 204 in Fig 5b) corresponding to the thick regions and the thin regions of the wafer 10, respectively.

Re claim 18, the references including Schiltz lack determining the thick and thin regions by mapping the substrate surface.

However, Ledger teaches determining and measuring variation of wafer thickness by mapping the substrate surface (col 1, lines 7-10; col 10, lines 18-32; col 7, lines 30-31; Figs 1-8), wherein the mapping techniques includes ellipsometric mapping (at Fig 1; col 7, lines 60-63; col 8, lines 1-4), laser mapping (col 8, lines 26-29); and capacitance mapping (col 1, lines 56-59).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the method of the references including Schiltz to determine the thick and thin regions by mapping the substrate surface, as taught by Ledger. This is because of the desirability to precisely determine the locations of thick and thin regions on the wafer so that narrow and wide regions can be correspondingly and precisely formed respectively thereon.

9. Claims 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schiltz et al (6,387,808) taken with Van Der Plas (5,015,602) and Atkinson (5,155,053), as applied to claims 12,13,16 and 17 above, and further of Kozhukh (6,437,903).

The references including Schiltz, Van Der Plas, and Atkinson teach a method as applied to claims 12,13,16 and 17 above.

The references thus lack mentioning a machine-accessible medium including data that, when accessed by a machine, cause the machine to perform the methods.

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However, Kozhukh teaches (at col 6, lines 58-61; col 4, lines 10-45) about employing a machine-accessible medium including data that, when accessed by a machine, cause the machine to perform the methods.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to store the methods of the references including Schiltz in a machine-accessible medium, as taught by Kozhukh so that when accessed by a machine, cause the machine to perform the stored methods in an automatic manner.

10. Claims 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schiltz (6,387,808) taken with Van Der Plas (5,015,602), Atkinson (5,155,053), and Banks (5,112,440), as applied to claims 14-15 above, and further of Kozhukh (6,437,903).

The references including Schiltz, Van Der Plas, Atkinson, and Banks teach a method as applied to claims 14-15 above.

The references thus lack mentioning a machine-accessible medium including data that, when accessed by a machine, cause the machine to perform the methods.

However, Kozhukh teaches (at col 6, lines 58-61; col 4, lines 10-45) about employing a machine-accessible medium including data that, when accessed by a machine, cause the machine to perform the methods.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to store the methods of the references including Schiltz in a machine-accessible medium, as taught by Kozhukh so that when accessed by a machine, cause the machine to perform the stored methods in an automatic manner.

#### ***Response to Amendment***

11. Applicant's remarks filed October 14, 2005 with respect to pending claims have been considered, but they are not persuasive and moot in view of the new ground(s) of rejection.

**\*\* Applicant's mainly remarked that "...Schiltz do not have *near-resolution masks added*..."**

In response, this is noted and found unconvincing. As clearly shown in Figures 2a-2b, the mask 22 having a plurality of near-resolution marks added, wherein a plurality of larger near-

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resolution marks and smaller near-resolution marks are added and included into the mask 22 so that a plurality of openings 24 are formed between these near-resolution marks. By exposing photoresist photosensitive resin 20 disposed on the layer 16 of material to light through a mask 22 (Fig 2a; col 2, lines 41-47; line 64 through col 3; col 3, lines 41-50) having a pattern to which near-resolution marks have been added with a plurality of openings 24 formed between the added near-resolution masks, portions of the layer 16/20 of material can be selectively removed so as to leave the narrow regions and the wide regions (e.g. narrow region 21 in Fig 2b; and 202 in Fig 5b; and wider region 21 in Fig 2b; and wider region 204 in Fig 5b).

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Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

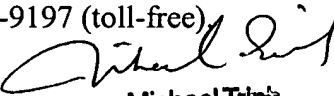
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 9:00 Am to 5:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The central fax phone number is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).  
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Michael Trinh  
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